Japanese Carbon and Alloy Flat Products Exclusion Request

Product Category: Hot-Rolled Products (#3)

(a)	Product Designation/HTS	**ASTM A607 GR55-modified hot-rolled steel** 7225.30.30.00
(b)	Product Description	Certain hot-rolled steel of great hardness, heat-resistance and abrasion-resistance made to specification ASTM A607 GR55 modified, for further processing into OCTG pipe products, with chemical composition of (a) Ni: 0.10% max, (b) Cr: 0.55-0.75%, (c) Mo: 0.106-0.15%, (d) Cb: 0.02% min. or V: 0.04% min.
(c)	Basis for Exclusion	See text below
(d)	Names and Location of U.S. and Foreign Producers	See Attachment A
(e)	U.S. Consumption	See Attachment B
(f)	U.S. Production	See Attachment B
(g)	Substitutible Products	See Attachment C

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[ ] of Japan produces a specialized hot-rolled steel product that is used in tubing for offshore oil production. [ ] sells a modified grade ASTM A607 G55 to SeaCAT Inc. of Houston, Texas, which manufactures "SeaCAT umbilical tubing" for deepwater use.[1] Given the extreme pressure of deepwater, the steel used in such tubing must be defect free. No U.S. producer makes a steel product equivalent to [ ] ASTM A607 G55 (modified).

SeaCAT developed its high strength tubing to meet the needs of oil companies that have moved oil production further offshore into deeper water. Conventional oil platforms are too expensive to build and maintain so floating structures are being used in deep sea situations. Wellheads are set on the seabed and lines carrying treating fluids such as methanol and glycol link the wellheads to a production platform located in shallow water. These lines were traditionally made of high pressure plastic, but as wellheads are moved further from shore the costs increase significantly while the reliability of plastic tubing decreases. In particular, methanol seeps through plastic over time, thereby degrading the utility of plastic tubing.

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1 Attached as **Attachment D** is a product brochure for SeaCAT umbilical tubing.

Alternatively, SeaCAT uses [ ] ASTM A607 GR55 (modified) in its umbilical tubing. This hot-rolled steel comes as sheet in coil that SeaCAT then slits and rolls into tubing of approximately 1½" exterior diameter. The surface of [ ] product is defect free, which strengthens the tubing to withstand the extreme pressure of the deep sea. In addition, the steel has a minimum yield strength of 55,000 ksi, and SeaCAT anneals it to increase the strength to 85,000 ksi. U.S. producers cannot meet these demanding requirements and these characteristics are irreplaceable.

Imports of ASTM A607 GR55 are typically more expensive than U.S. hot-rolled steel. As shown in **Attachment B**, the unit price for certain coated steel sheet for ASTM A607 GR55 from Japan ranged from [ ] during the period of investigation. Compare these prices to the pricing data collected by the Commission for selected pricing products which are intended to be representative of U.S. prices of hot-rolled steel products in general.[2] This attachment demonstrates the significant overselling of this specialty product imported from Japan. Imports of high-priced specialized products have no detrimental effect on the domestic industry and warrant exclusion from any remedy recommendation.

Finally, it has been SeaCAT's experience that no domestic steel manufacturer has been willing or able to produce a competitive product to [ ] hot-rolled steel.[3] Acme steel, which recently went out of business, was unable to qualify as a producer because of quality control issues.[4] Bethlehem walked away from business because the volumes were not large enough to be profitable.[5]

Because there is no viable alternative to [ ] specialty hot-rolled steel product, any additional import restrictions would unfairly harm SeaCAT's ability to produce its product. A domestic industry that does not produce this specialty product is not deserving of such trade restraints. We urge the USTR to exclude this product from any remedy recommendation that may result from this investigation.

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2 *See* ITC's Staff Report at Tables FLAT-68, FLAT-69 (public version).

3 *See* Affidavit of Philip Lewis, President of SeaCAT (**Attachment D**).

4 *Id.*

5 *Id.*

Attachment A

Foreign Producers

(1) [ ]

- Address: [ ]
- Phone: [ ]
- Fax: [ ]

Domestic Producers

- No Known Domestic Producers

HOT-ROLLED

ASTM A607 Gr55-modified (Hot Rolled)

Quantity						January - June		Projections				
Company	**1996**	**1997**	**1998**	**1999**	**2000**	**YTD 2000**	**YTD 2001**	**2001**	**2002**	**2003**	**2004**	**2005**
[	0	1,592	2,322	0	0	0	0	0	0	0	0	0
Total	0	1,592	2,322	0	0	0	0	0	0	0	0	0]

Value[*]						January - June		Projections				
Company	**1996**	**1997**	**1998**	**1999**	**2000**	**YTD 2000**	**YTD 2001**	**2001**	**2002**	**2003**	**2004**	**2005**
[	608,018	1,027,564	1,474,917	95,017	398,306	189,742	99,186	220,698	220,698	220,698	220,698	220,698
Total	608,018	1,027,564	1,474,917	95,017	398,306	189,742	99,186	220698	220698	220698	220698	220698]

[Unit Price	0	0	0	0	0	0	0]					
U.S. Production	0	0	0	0	0	0	0	0	0	0	0	0
Imports from Other Countries	0	0	0	0	0	0	0	0	0	0	0	0
Total U.S. Consumption												
[Quantity	0	1,592	2,322	0	0	0	0	0	0	0	0	0]
[Value	608,018	1,027,564	1,474,917	95,017	398,306	189,742	99,186	220,698	220,698	220,698	220,698	220,698]

Attachment C

Known Substitutable Products: None

U.S. Production: None

U.S. Producers: None

Attachment D

SeaCAT Corporation

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AFFIDAVIT OF PHILIP LEWIS
PRESIDENT, SEACAT CORPORATION -- HOUSTON, TEXAS

I, Philip Lewis, declare and state to the best of my knowledge, information, and belief, that:

1. I am the President of SeaCAT Corporation in Houston, Texas. I have been buying ASTM A607 GR55 Modified (4115) hot-rolled steel for a number of years. SeaCAT employs 38 welders, fabricators, machinists, engineers and support staff. We purchase [ ]'s hot-rolled heat and abrasion resistant steel.

2. The hot-rolled steel of grade ASTM A607 GR55 Modified (4115) is a specialty product with unique performance characteristics including hardness, heat and abrasion-resistance and is used in applications where the steel must be very strong and consistently free of any defect. Specifically, SeaCAT uses this steel in the production of umbilical tubing for deepwater applications in the production of oil and gas. As exploration for oil producing fields moves farther offshore to deepwater sites, the industry requires tubing that can withstand high pressure atmospheres as well as have corrosion resistant properties for sea water applications. At SeaCAT, we manufacture tubing that is used for hydraulic and chemical injection lines linking the wellhead to the production platform.

3. While we have tried working with domestic steel manufacturers such as Bethlehem and Acme Steel in developing a suitable tubing steel, the quality of the steel was inferior in its performance capabilities as compared to the Japanese product. Specifically, the consistency and cleanliness of the steel is critical. One firm had difficulty producing steel that was clean enough to use in our applications. I understand now that Acme is in bankruptcy and has shut down. Bethlehem, on the other hand, while technically able to produce the product, found that due to the limited volumes necessary to complete our orders, was not sufficiently profitable to continue doing business. Consequently, we can't source this product from any domestic manufacturer.

4. Our customers are willing to pay a premium for products that will not fail. Because the umbilical tubing is a relatively low cost element in the offshore production of oil, our customers place more importance on the fact that they will not have to suspend operations due to materials failure. Further, because we are a small business, our reputation for providing a high quality product depends on the integrity of the materials we use. If we could source an equivalent product domestically, we would. However, its simply not available to us.

5. We produce two product lines at SeaCAT and today, on a value basis both product lines are equally successful. Historically though, on a tonnage basis, we have sold significantly more of the product using imported carbon steel. Due to the business cycle of the oil business, demand for our products has been strong. While oil and gas prices

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somewhat influence the demand for my product, import restrictions on high value added products such as A607 steel would unnecessarily increase the cost of our product.

6. This hot-rolled product produced by [ ] is not available in the United States, either because domestic producers cannot or choose not to produce small quantities of it. Our business would suffer if we were not able to buy this product at competitive prices. Because it does not compete with any other U.S. hot-rolled product, it should be excluded from this 201 Steel investigation.

Mr. Philip Lewis
President of SeaCAT Corporation
Houston, Texas

Dated: 8 Nov 01

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SeaCAT Corporation

SeaCAT™ Umbilical Tubing

History

As offshore oil production has moved to deeper water, conventional production platforms have become too costly. The steel support structures increase exponentially as the water depth increases. So floating structures have been adopted. Another technique used in deepwater is known as subsea production. In this method, wellheads are set on the seabed and production is controlled remotely. The production flows through subsea pipe lines and the wellhead control consists of hydraulic and electrical systems. Umbilicals of electrical and hydraulic lines link the wellhead to a production platform that is often closer to shore in shallow water. In addition, chemical injection lines are often used for production treating fluids such as methanol, scale inhibitors and glycol.

Traditionally, the hydraulic umbilical control lines have been made from high pressure plastic hose that was satisfactory when the runs were relatively short and the depths shallow. As the runs get longer and the depths deeper, the costs become very significant and collapse of plastic hose is a problem at deeper water depths. Further, hydrate control often dictates the use of methanol in the flow lines. The methanol seeps through the plastic hose over time. To overcome these problems, metal tubes are now being used for the chemical injection and hydraulic control umbilicals. These metal tubes have been made of expensive corrosion resistant alloys, such as super duplex stainless steel, which are cost effective as long as the sizes are small and the runs short. The lines have been made by welding together short lengths (25 m) of tubing into long coils and then bundling several tubes into an umbilical. There is now a need for longer, larger and more economical umbilical lines, particularly for the outer continental shelf of the Gulf of Mexico (GOM).

The DeepStar Project, a research consortium of 21 major oil companies, focused on developing alternative materials that offer the higher pressure ratings and larger diameters needed for the longer runs. In order to utilize carbon steel, two issues needed to be addressed, internal cleanliness and external corrosion protection. Subsea carbon steel pipelines have been protected from corrosion with plastic coatings and large aluminum anodes that offer sacrificial, cathodic protection to the steel pipe. This same technique could be used on umbilicals, but the economics of the small lines and the desire to bundle the lines make setting numerous anodes unattractive. The DeepStar II program researched the concept of applying a continuous aluminum coating directly to the steel tube to serve as both the barrier coating and as the sacrificial anode. This smooth, continuous coating allows the tube to be coiled on to large reels and laid offshore directly off the reel without having to stop for splice welds or to attach anodes.

The industry was seeking a cost effective solution to replace the expensive super duplex stainless steels. In addition to costs, the lead times of corrosion resistant alloys make project planning difficult. Induction welded carbon steel tubing is commercially produced at very high speeds with ample production capacity. It is produced in coil form in lengths up to 10,000 m with a girth weld approximately every 1,000 m. The economical method of manufacturing ERW steel tubing is well proven in line pipe and OCTG tubing.

The SeaCAT™ Product

The technical barriers to the use of carbon steel for umbilical tubing were:

- An economical outside coating to provide extended life in deepwater environments. Preferably the coating would be both a barrier coating and an anode to avoid the necessity of applying anodes to the bundles of plastic coated tubing.

- For hydraulic control lines it is essential to have a very clean internal bore to provide reliable operation of safety valves. A cleanliness level of NAS 6 is desired. A method of cleaning a continuous length of small diameter tubing up to 10,000 m was required.

With these goals in mind, SeaCAT Corporation set out to develop the tubular product for Shell's Mensa project. Shell set the product parameters and provided the corrosion testing while SeaCAT developed the manufacturing techniques. A number of coatings and manufacturing methods were reviewed and ultimately the economical choice became a zinc coating with sufficient thickness to last for an extended period of time in deepwater. Typically, in general corrosion, zinc corrodes in deep sea water at the rate of about 15-20 microns per year. For a minimum life of 30-40 years, a zinc coating thickness of 0.75 mm (750 microns) is considered suitable in general corrosion. Should the coating be physically damaged, the zinc must also act as a sacrificial anode for protection of the steel substrate. Since hot dip galvanizing typically deposits a coating thickness of about 90 microns, other methods of manufacture were explored to give greater thickness to the coating. Ultimately it was decided that extrusion was a very efficient means of continuously cladding zinc alloys.

Typically, there are two types of zinc anodes used in sea water applications, Type I and Type II. The Type I is the older method before zinc was smelted rather than electrolytically refined to yield very low residuals. Type II maintains a very low iron content to keep the surface active. SeaCAT™ zinc anode actually adds a very low amount of iron into the zinc to make the surface more passive and retard pitting and general corrosion. Yet, the cathodic characteristics of the anode are calculated to be more than sufficient to protect a bare area of anode of 10% for more than 50 years.

To achieve a sufficient cleanliness level in the internal bore, experiments were run to test cleaning procedures. This work began under the DeepStar II program, but was continued by Shell and SeaCAT. A sufficient level of cleanliness for hydraulic control lines has been proven for use with glycol base hydraulic fluids.

The SeaCAT™ 19D Product

SeaCAT Corporation has also developed a product, SeaCAT™ 19D, as a cost effective, corrosion resistant, high pressure alternative for umbilical tubing where internal corrosion resistance is an issue. The original SeaCAT™ tubing is a high strength, quench and tempered, chrome-moly alloy steel with an extruded zinc anode sheath on the outside, and was developed as an alternative to 2507 super duplex stainless steel (SDSS) umbilical tubes, particularly for the larger sizes where economics and availability are significant issues. In certain chemical injection applications where the fluids are low pH, asphaltine scale inhibitors, the corrosion rate of carbon steel may be too high for long term service life. Further, the ID cleanliness issue of using carbon steel with glycol based hydraulic fluids requires some care in the control of the fluids. SeaCAT™ 19D utilizes a low alloy, duplex stainless steel with a strength level close to SDSS and SeaCAT™, and like carbon steel it requires cathodic protection for long life in sea water. The base alloy of the tube is Nitronic® 19D, an AK-Armco alloy, that is much simpler to process than SDSS and is available in strip form to allow economical manufacturing using a conventional seam welded tube. A zinc anode is extruded over the tube for external corrosion protection in seawater.

SDSS is a good technical product for umbilical tubing because of the high yield strength, hence higher pressure capability, and the ability to resist pitting corrosion in salt water without the use of cathodic protection (CP). The downsides of SDSS are cost of the base alloy, difficulty to produce, limited number of manufacturers and the limited production capacity that can cause long lead times.

Interestingly, corrosion resistance of the inside of the tubing is not a problem with lower grade stainless steels, only the outside in salt water environments. Lower grades of stainless steel, such as 304L or 316L are satisfactory for lower pressures given the lower yield strength and meet the internal corrosion resistance requirements for most applications. However, because of external corrosion in saltwater and the problem of crevice corrosion where the tubes touch, cathodic protection would be required. Because the yield strength of 304L/316L is limited to about 30 KSI, the small tubes are limited to about 5,000 PSI working pressure.

The design concept of using cathodic protection for seawater protection can be extended to higher strength, duplex stainless alloys, such as 2205. However, since the cost of 2205 is close to the 2507, it makes more sense to use 2507 without CP. Hence the need for an economical stainless steel alloy that will provide sufficient internal corrosion resistance with the strength of SeaCAT™ or SDSS.

Manufacturing Issues

To make tubing in very long coils in an economic manner, the choice of seam welded tube is obvious. Regardless of the alloy selection, welding together short seamless joints of tubing adds significantly to the processing cost. SDSS is generally manufactured in seamless tubing and therefore requires considerably more joints, or short coils, to be welded together. In the case of SeaCAT™, the tube is welded using high speed induction welding. Seam welded stainless steel is usually TIG, laser or plasma welded at much lower speeds. However, because the feedstock is strip, the coils can be built up into very long lengths with a proven process. In the manufacture of welded stainless steel tubing, the tube is bright annealed in-line on both the OD and ID, therefore giving a very clean bore without an additional cleaning process. SeaCAT Corporation will be manufacturing the full size range of SeaCAT™ 19D tubing and Gibson Tube, in North Branch, NJ, can supplement the smaller sizes to increase output.

In a 1/2" OD SeaCAT™ 19D tube, up to 100,000 feet (20 miles) can be put on a utility cable reel that weighs up to 20 tons. This allows the umbilical to be bundled on a cabling machine without stopping to make welds for up to 20 miles. Where girth welding the tubes is required, the SeaCAT™ 19D is a very weldable alloy without the complications of intermetallic phase formation.

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Metallurgical Issues

Salt water pitting resistance of a stainless steel is primarily determined by the content of chromium, molybdenum and nitrogen. An index used to compare this resistance is the PRE (Pitting Resistance Equivalent: PRE = %Cr + 3.3 X %Mo + 16 X %N). With a PRE of 41, SDSS can withstand salt water pitting without CP. A PRE below 40 would require cathodic protection for long term life in salt water.

Metallurgically, the simplest alloys in stainless steel are single phase, either ferritic or austenitic. The ferritic grades are lower chromium, but do not have corrosion resistance to avoid the all of the internal corrosion issues. The austenitic grades, such as 316L, solve this problem with higher chrome, but strength is a problem for higher pressure applications. Just the addition of nitrogen to a 316L grade will raise the yield strength, however it is still far short of the yield strength of SDSS or SeaCAT™.

There are a several lean duplex stainless steels that contain no molybdenum, yet maintain adequate strength levels for umbilical applications. One example is an Armco alloy, Nitronic® 19D. This alloy is cost effective, simplifies the weld processing and can be made into seam welded tubing. A comparison of stainless steel chemistry, strength and pitting resistance is as follows:

	Cr	Ni	Mo	N	Mn	YS (KSI)	TS (KSI)	PRE
2507	25	7.0	4.0	0.30	1.2	80	110	41
2205	22	5.5	3.2	0.18	2.0	70	100	35
316L	17	12.5	2.5	-	2.0	30	70	25
Nitronic® 19D	20	2.0	-	0.12	5.0	80	110	22
304L	19	11.5	-	-	2.0	30	70	19

SDSS is a two-phase microstructure, hence the duplex term, of ferrite and austenite, preferably near a 50-50 mixture. When this balance is in place, corrosion resistance and mechanical properties are excellent for umbilical applications. However, heat treatment or welding can easily lead to formations of intermetallic phases, most notably the sigma phase. Sigma phase causes deterioration of the corrosion resistance and embrittlement. The formation is generally associated with welding and heat affected zones. In order to avoid the problem, welding is usually done with a nickel rich filler metal (non-autogenous welding). Control of this is problematic compared to autogenous welding.

When looking for a replacement for SDSS, it is desirable to select an alloy that does not pose these welding problems, so that seam welding and orbital autogenous welding can be used. The source of the sigma phase problem is principally molybdenum, however it is molybdenum that provides the most resistance to salt water pitting. The 2507 alloy contains 4% molybdenum, an expensive addition. The issue of external pitting can be solved with cathodic protection, and the internal corrosion requirements do not require the addition of molybdenum.

In the past several years, there have been several documented failures of welds of duplex stainless steels in subsea service. The failure mechanisms were hydrogen embrittlement resulting from hydrogen charging resulting from cathodic protection in seawater environments. The failures were typically in weld zones with adverse material conditions such as improper ferrite/austenite balance, excessive nitrides, intermetallic phase formation and undesirable grain orientation in forgings.

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Generally, the welding practice included heavier sections with multiple pass welds. The mechanism of hydrogen generation from cathodic protection is well understood and is particularly severe at terminations near large subsea structures where large aluminum anodes are used having a potential in the range of -1,100 mv. SeaCAT™ 19D weld procedures have been tested to provide satisfactory hydrogen embrittlement resistance under these conditions.

Conclusion

For many applications, such as wax, scale and hydrate control using methanol or glycol, the SeaCAT™ product is adequate. Some of the newer low dosage hydrate inhibitor polymers (LDHI) as well as ashphaltine scale inhibitors are slightly corrosive to carbon steel.

SeaCAT™ 19D has the strength to be used cost effectively at higher pressures while allowing easy processing that promotes the use of welded tube and simple girth welding processes. The corrosion resistance is ample for any internal corrosion issues. This would include acidic chemicals such as scale inhibitors, while offering a clean ID for hydraulic applications.

Like SeaCAT™, this product is extruded with a zinc sheath that acts as both a barrier coating and an anode. The standard product is offered as a 10,000 PSI working pressure tube that is available in very long coils. It may be blended with other SeaCAT™ tubes made of carbon steel with no special precautions, since both have the same barrier coating.

As to commercial success, since inception in 1996, SeaCAT Corporation furnished about 3.5 million meters of SeaCAT™ tubing for both chemical injection and hydraulic lines to a number of projects. Shell's Mensa project in the GOM is the longest umbilical to be laid to date (68 miles) and is over two times the length of the previous longest umbilical. Mensa is also in a record water depth of 1,780 meters. Projects for Shell, Marathon, Chevron, Newfield, Amarada Hess, Petrobras, Kerr McGee, Oryx, Anadarko, BP Amoco, ATP and Mariner have been competed. SeaCAT™ has been tested and proven successful for dynamic applications in a DeepStar III program. About a third of the projects completed have had dynamic sections.

To date nine projects in the Gulf of Mexico have been competed or are underway with a combination of SeaCAT™ and SeaCAT™ 19D. In addition, the largest subsea project in the Gulf of Mexico, BP Amoco/Shell Na Kika is also being done with SeaCAT™ and SeaCAT™ 19D. SeaCAT Corporation has over 12 million feet of umbilical tubing that has been installed and an additional 7 million feet is complete or underway and awaits fabrication into umbilicals or installation. Of the total of 19 million feet, 4.5 million feet has been the SeaCAT™ 19D.

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